

Applicant: Pasi Rajala et al.
PCT App. No.: PCT/FI2004/000271

Claim Listing

- 1–20. (cancelled)
21. (new) A method in the treatment of surface-sized paper, in a finishing section of a paper machine, comprising the steps of:
- drying a paper web, having a first side and a second side, in a forward dryer section of the paper machine in successive downward open drying groups that apply single-wire draws;
 - after the drying step, finishing the paper web by surface-sizing the web in a surface-sizing unit;
 - drying the surface-sized paper at least partly by contact-free drying in an after-drying section, the contact-free drying being accomplished by at least one airborne web-drying unit on each side of the paper web; and
 - controlling the curl created in the web in the forward dryer section by regulating power supplied to the at least one airborne web-drying unit on each side of the paper web.
22. (new) The method of claim 21 where the step of drying the surface-sized paper comprises drying the surface-sized paper by at least 50 percent by contract-free drying.
23. The method of claim 21, further comprising the step of impingement drying the paper web and controlling the tendency of curling created in the web in the forward dryer section by regulating the power of the impingement dryers.
24. (new) The method of claim 21, wherein the steps set fourth are applied to the treatment of fine paper.
25. (new) The method of claim 21, wherein at least 60 percent of the drying of the surface-sized paper is accomplished by contact-free drying.

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26. (new) The method of claim 21, wherein at least 60 percent of the drying of the surface-sized paper is accomplished by airborne web-drying and impingement drying.

27. (new) The method of claim 21, wherein at least 70 percent of the drying of the surface-sized paper is accomplished by contact-free drying comprising airborne web-drying.

28. (new) The method of claim 21 further comprising the step of controlling curl with a steam box which is placed in a position immediately before a reel-up.

29. (new) The method of claim 21, wherein the contact-free drying is used to profile the contact-free drying applied to the paper web, to control the curl profile in a cross direction of the paper web.

30. (new) The method of claim 21 wherein the step of controlling the curl includes controlling parameters of the drying power of drying cylinders in the after-drying section which are used in drying cylinder groups that use normal single-wire draws.

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31. (new) A paper machine including a finishing section, the paper machine comprising;

a forward dryer section having successive downward open drying groups with single-wire draws;

a surface-sizing unit following the forward dryer section, in said finishing section;

a first contact-free airborne web-drying unit following the surface-sizing unit which is arranged to dry a first side of a paper web extending through the forward dryer section to the surface-sizing unit to the first airborne web-drying unit;

a second contact-free airborne web-drying unit following the surface-sizing unit which is arranged to dry a second side of a paper web extending through the forward dryer section, to the surface-sizing unit, to the first contact-free airborne web-drying unit, and the second airborne web-drying unit;

a controller in power controlling relation, which is a curl controlling relationship, to the first contact-free airborne web-drying unit and the second contact-free airborne web-drying unit.

32. (new) The paper machine of claim 31 further comprising impingement drying units following the airborne web-drying units, configured to receive the paper web therein.

33. (new) The paper machine of claim 31 wherein the downward open drying groups with single-wire draws immediately precede the surface sizing unit.

34. (new) The paper machine of claim 31 wherein all the drying groups of the forward dryer section are successive downward open drying groups with single-wire draws which precede the surface sizing unit.

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35. (new) The paper machine of claim 31, wherein an after-drying section includes the first contact-free airborne web-drying unit and the second contact-free airborne web-drying unit, and all other drying units after the surface-sizing unit, and wherein an amount of power at least 60 percent of a total drying power available to the after-dryer section is available to drying units which are contact-free which include the first contact-free airborne web-drying unit and the second contact-free airborne web-drying unit.

36. (new) The paper machine of claim 31, wherein an after-drying section includes the first contact-free airborne web-drying unit and the second contact-free airborne web-drying unit and all other drying units after the surface-sizing unit, and wherein an amount of power at least 70 percent of a total drying power available to the after-dryer section is available to airborne drying units which include the first contact-free airborne web-drying unit and the second contact-free airborne web-drying unit.

37. (new) The method of claim 31, wherein the paper web is fine paper.

38. (new) A paper machine, including a finishing section, and a web; the paper machine and web comprising;

- a paper web;
- a forward dryer section having successive downward open drying groups that apply single-wire draw;
- surface-sizing devices positioned downstream of the forward dryer section and in paper receiving relation to the forward dryer section;
- a means for drying at least partly based on contact-free drying, of which means at least two dryers are airborne web-dryers or impingement dryers, positioned on two sides of the paper web which extends from the forward dryer section to the surface-sizing device to the means for drying; and
- a controller in power controlling relation, which is a curl controlling relationship, to the airborne web-dryers or impingement dryers positioned on two sides of the paper web.

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39. (new) The paper machine of claim 38, wherein the drying means comprises dryers that are based on airborne web-drying and impingement drying.

40. (new) The paper machine of claim 38, wherein the drying means comprises dryers which are positioned on both sides of the web and which are arranged so that the controller in power controlling relation separately controls temperature and blowing speed on the two sides of the web.

41. (new) The paper machine of claim 38, wherein a steam box is positioned immediately before a reel-up, and after the means for drying, so that the paper web is colder than in the means for drying.

42. (new) The paper machine of claim 38, wherein the drying means are profiling dryers to control the curl profile in the cross direction of the web.

43. (new) The paper machine of claim 38, wherein the means for drying comprises at least two drying cylinder groups that apply normal single-wire draw.